

Applicant: Antti Poikolainen et al.
Application No.: 10/525,275
Art Unit: 1731

Claim Listing

1–18. (cancelled)

19. (currently amended) A method of forming a web in a twin-wire formation section of a paper or board machine, comprising the steps of:

supplying a lip jet of fibrous stock from a headbox to a first forming wire forming a first wire loop so that the fibrous stock travels only on the first forming wire;

moving a second forming wire forming a second wire loop against a fixed forming shoe, the forming shoe having a leading edge and a deck having a curved surface, the second forming wire being supported by and moves against an area defined by the curved surface of the forming shoe deck;

bringing the fibrous stock on the first forming wire into engagement with the second forming wire on the curved surface of the forming shoe deck at a position after the forming shoe leading edge, the first forming wire being unsupported in the area defined by the curved surface of the shoe;

guiding the fibrous stock between the first and second forming wires so that dewatering of the fibrous stock begins after the shoe leading edge, wherein essentially non-pulsating dewatering takes place in the first dewatering zone;

removing water from the fibrous stock in a successive second dewatering zone through which the first forming wire, the second forming wire and the fibrous stock therebetween travel, the second dewatering zone formed by fixed dewatering blades which extend in a cross-machine direction, and engage one of the forming wires, the fixed dewatering blades defining gaps therebetween;

and

supporting against the other of the forming wires movable dewatering blades, which are loaded in a controlled fashion opposite the gaps and between the fixed dewatering blades against the fibrous stock between the forming wires so that the second dewatering zone causes pulsating dewatering in the fibrous stock.

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20. (previously presented) The method of claim 19, further comprising the step of applying underpressure to the fibrous stock through the deck of the fixed forming shoe.

21–24. (canceled)

25. (currently amended) A twin-wire forming section of a paper or board machine, comprising:

a headbox;

a first forming wire forming a first wire loop with the aid of first guiding rolls and a first breast roll;

a second forming wire forming a second wire loop with the aid of second guiding rolls and a second breast roll, wherein the second breast roll is spaced further from the headbox than the first breast roll is spaced from the headbox;

the first forming wire and the second forming wire forming a twin-wire dewatering area therebetween, said twin-wire dewatering area being located after the first forming wire passes over the first breast roll, and the second forming wire passes over the second breast roll, said twin-wire dewatering area having a beginning, the dewatering area arranged in to at least a first dewatering zone, and a second successive dewatering zone;

wherein the headbox is arranged to form a lip jet directed to engage only the first forming wire at a location spaced from the first breast roll and before the twin-wire dewatering area, such that a lip jet will travel only with the first forming wire until the beginning of the twin-wire dewatering area;

a fixed forming shoe in the first dewatering zone having a curved surface deck, and a leading edge, the curved surface deck in supporting engagement with the second forming wire with the leading edge extending towards the second breast roll so that the leading edge is positioned before the beginning of the dewatering area;

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wherein the first forming wire is unsupported over the fixed forming shoe;
wherein the second and successive dewatering zone is formed by a plurality of fixed dewatering blades engaging one of the forming wires in the cross-machine direction and supported against ~~[[the]]~~ a fibrous stock between the first forming wire and the second wire, wherein the fixed dewatering blades define gaps therebetween;
a plurality of movable dewatering blades mounted for a loading motion in a controlled manner against the fibrous stock located between the first forming wire and the second wire, the movable dewatering blades being opposite the gaps and engaging the other forming wire at the gaps in between the fixed dewatering blades, so causing pulsating dewatering in the fibrous stock in the second dewatering zone; and
wherein the fixed forming shoe is provided with an essentially open surface and a source of underpressure arranged under the forming shoe so as to cause essentially non-pulsating dewatering in the fibrous stock traveling in between the forming wires.

26–30. (cancelled)

31. (previously presented) The apparatus of claim 25, wherein the open surface area of the deck of the fixed forming shoe is at least 50 percent of the total surface area of the shoe.

32. (previously presented) The apparatus of claim 25, wherein the open surface area of the deck of the fixed forming shoe is formed of holes extending through the deck.

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33. (previously presented) The apparatus of claim 32, wherein the holes extending through the deck and forming the open surface area of the deck of the fixed forming shoe are arranged at an angle in relation to the top surface of the deck and against a first direction and wherein the first wire and the second wire are mounted to travel in the first direction.

34. (previously presented) The apparatus of claim 25, wherein the radius of curvature of the deck of the fixed forming shoe is between 600 mm and 4000 mm.

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35. (currently amended) A hybrid forming section of a paper or board machine, comprising:

a fourdrinier first forming wire forming a first loop, and an upper horizontal surface;
a headbox arranged to form a fibrous stock on the upper horizontal surface;

dewatering equipment arranged under the upper horizontal surface so that ~~[[the]]~~ a fibrous stock layer on the upper horizontal surface is dewatered only in a downward direction;

a former unit fitted on top of the fourdrinier first forming wire and spaced in a downstream direction from the dewatering equipment, the former unit having a second forming wire forming a second wire loop;

the fourdrinier first forming wire and the second forming wire forming a twin-wire dewatering area therebetween, said area having a beginning; in such a way that at the beginning of the twin-wire dewatering area a wedge-like gap is formed, into which a fibrous stock on the fourdrinier first forming wire is arranged to travel;

wherein the twin-wire dewatering area is arranged into at least a first dewatering zone and a second successive dewatering zone;

wherein at least a part of the first dewatering zone is formed with at least one fixed forming shoe having a curved surface deck, and a leading edge, the curved surface deck in engagement with the second forming wire, and wherein the second forming wire is arranged not to contact a ~~layer of~~ fibrous stock on the first forming wire until after the leading edge of the fixed forming shoe;

wherein the fourdrinier first forming wire is unsupported at the fixed forming shoe;

wherein the second successive dewatering zone is formed by a plurality of fixed dewatering blades engaging the second forming wire in the cross-machine direction and supported against a fibrous stock between the second forming wire and the fourdrinier first forming wire;

wherein the fixed dewatering blades define gaps therebetween;

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a plurality of movable dewatering blades mounted for a loading motion in a controlled manner against the fourdrinier first forming wire and a fibrous stock located between the fourdrinier first forming wire and the second forming wire, the movable dewatering blades opposite the gaps and engaging the fourdrinier first forming wire at the gaps in between the fixed dewatering blades, so causing pulsating dewatering in a [[the]] fibrous stock in the second dewatering zone; wherein the fourdrinier first forming wire and the second forming wire are guided from the beginning of the twin-wire forming section into the area of the fixed forming shoe of the first dewatering zone, and wherein the fixed forming shoe is provided with an essentially open surface connected to a source of underpressure arranged over the forming shoe so as to cause essentially non-pulsating dewatering in a [[the]] fibrous stock traveling in between the fourdrinier first forming wire and the second forming wire; and wherein the non-pulsating dewatering in the first zone is applied to a fibrous stock in an area after the leading edge of the forming shoe.

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36. (currently amended) A method of forming a web in a hybrid formation section of a paper or board machine, comprising the steps of:

supplying and guiding a fibrous stock from a headbox onto an upper horizontal surface of a fourdrinier first forming wire forming a fourdrinier former, the fourdrinier first forming wire forming a first wire loop;
dewatering the fibrous stock on the upper horizontal surface of the fourdrinier first forming wire from one direction only with dewatering equipment below the upper horizontal surface of the fourdrinier first forming wire;
following dewatering in one direction only on the fourdrinier first forming wire, passing the dewatered fibrous stock into a gap formed between the fourdrinier first forming wire and a second forming wire positioned on top of the fourdrinier first forming wire, the second forming wire defining a second wire loop which defines a twin-wire former with the fourdrinier first forming wire;
non-pulsating dewatering the fibrous stock in a first dewatering zone following the gap of the twin-wire former with at least one fixed non-pulsating forming shoe having a curved surface deck and a leading edge, the curved surface deck in engagement with the second forming wire;
drawing an underpressure on an essentially open surface of the forming shoe from above the forming shoe, and guiding the second forming wire so the second forming wire does not contact the ~~layer of~~ fibrous stock on the first forming wire until after the leading edge of the fixed forming shoe, and wherein the second forming wire is supported by and moves against an area defined by the curved surface of the shoe while the fourdrinier first forming wire positioned opposite the second forming wire is unsupported in the area defined by the curved surface of the shoe;
removing water from the fibrous stock in a successive second pulsating dewatering zone through which the fourdrinier first forming wire, the second forming wire and the fibrous stock ~~travel~~ therebetween travel, the second dewatering zone

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formed by fixed dewatering blades extending in a cross-machine direction, and engaging the second forming wire, the fixed dewatering blades defining gaps therebetween; and

supporting against the fourdrinier forming wire movable dewatering blades, and loading in a controlled fashion the movable dewatering blades opposite the gaps and between the fixed dewatering blades against the fibrous stock between the forming wires so that the second dewatering zone causes pulsating dewatering in the fibrous stock.

37. (previously presented) The apparatus of claim 25, wherein the headbox has a profile bar and wherein the profile bar and the forming shoe are on the same side of the headbox.